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TRANSLATION VERIFICATION

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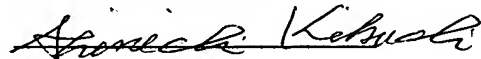
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January 19, 2006

Shinichi Kikuchi



SPECIFICATION

## TITLE OF THE INVENTION

A container cap

## TECHNICAL FIELD

5 [0001]

This invention relates to a cap for closing an opening of a container such as a PET bottle, for example and more particularly to a container cap comprising cap opening proof or history indication means to indicate a cap opening history or tamper-proof.

10 BACKGROUND OF TECHNOLOGY

[0002]

Generally, a container cap is required to indicate a cap opening proof (tamper-proof) by means of breakage or deformation of the cap made from a state of the cap before it is opened, in order to prove a cap opening. Such cap opening proof indication means generally comprises an annular band connected through a bridge to a lower edge of a crown-like cap body which should be screwed onto a mouth of the container. A plurality of flaps extending from the annular band on the inner side thereof are engaged with a lower engagement portion of a neck of the container.

20 [0003]

As the cap body is opened, it is disengaged from the container by breaking the bridge while the annular band is engaged with the lower engagement portion of the neck of the container. Thus, only the annular band is left on the lower portion of the neck of the container so as to indicate the cap opening proof.

25 [0004]

Explaining a PET bottle comprising a container of resin and a cap of resin as an example, in order to secure a sealing property between the cap

and a neck screw portion of the container which the cap is screwed onto and also in order to enable the cap to be opened and closed in a smooth manner, the cap and the container are made from the resin of different hardness. However, as the annular band for indicating the cap opening proof after the cap is opened is kept to be left on the neck part of the cap, the annular band should be removed from the PET bottle when the bottle has to be collected and recycled, which obstructs recycling the containers.

[0005]

Accordingly, there has conventionally been proposed a cap adapted to be able to remove an annular band for indicating the cap opening proof kept to be left on the bottle (see Patent Document 1). Such a cap has splits provided in the annular band and the splits enable the annular band to be removed by picking the annular band through the splits with the fingers of the user. However, since such a cap is allowed to have the annular band left on the bottle, the operation of removing the annular band when the container should be recycled is required and therefore the recycling operation cannot be effectively performed.

[0006]

On the other hand, the applicant has proposed a cap adapted to have an annular band removed from a container together with a cap body without leaving the annular band when the cap is opened (see Patent Document 2)

[0007]

This cap comprises a crown-shaped cap body having a plurality of skirt pieces circumferentially formed in a manner independent from each other by splitting the lower portion thereof and an annular band having a plurality of band split pieces each integrally extending from each skirt piece of the cap body. The adjacent band split pieces are joined to each other through a bridge and each of the band split pieces has a flap extending

upwardly from the inner side thereof. The flap is adapted to be engaged with a protrusion stripe annular engagement portion provided on the lower portion of the cap neck part on its outer surface.

[0008]

5           In the thus constructed cap, when the cap body upwardly moves by rotating it so as to release the cap body from being screwed from a container body in order to open the container, the flap of each band split piece is displaced horizontally along the protrusion stripe annular engagement portion and therefore, the band split pieces of the annular band are expanded  
10 in a manner spaced circumferentially from each other. Thus, the bridge joining the band split pieces to each other is broken and as the cap body further upwardly moves, the flaps pass over the engagement portion so as to be downwardly suspended and each band split piece of the annular band is removed from the container in a manner integrated with the cap body.

15 [0009]

Since the thus constructed cap has the annular band removed from the container together with the cap body, the operation of removing the annular band is not required when the container is collected and recycled and therefore the recycling operation can be effectively performed.

20 [0010]

However, since the flaps of the cap passing over the protrusion stripe annular engagement portion and removed from the container after the cap is opened are kept to be danglely suspending from the cap body at the opening portion thereof so as to protrude in an inner diametrical direction  
25 from the cap body, the cap cannot be screwed onto the neck part of the container due to the obstruction of the flaps when the container should be closed by this cap. In order to avoid this, the cap has to be screwed onto the neck part of the container while the flaps are manually forced onto the inner

faces of the corresponding band split pieces and therefore the operation of closing the container by the cap is disadvantageously made troublesome.

[0011]

Furthermore, since the cap of this construction has a plurality of band  
5 split pieces formed so as to form the annular band along the whole periphery  
of the lower edge of the cap body in the same manner as the annular band of  
the conventional cap has, which is kept to be left on the neck part of the  
container, much material need be used and therefore the cap is made  
expensive.

10 [0012]

[Patent Document 1] JP2002-114245A

[Patent Document 2] JP2003-200951A

[0013]

An object of the invention is to provide a container cap adapted to  
15 again close a container after it is once opened without any obstacle of flaps  
and easily perform an operation of closing the container by the cap.

[0014]

Another object of the invention is to provide a container cap adapted  
to be more inexpensively manufactured by saving more material to be used  
20 for forming cap opening proof means.

## DISCLOSURE OF THE INVENTION

[0015]

According to the invention, there is provided a container cap  
25 comprising a crown-shaped cap body to be screwed onto a container and cap  
opening proof indication means provided at a lower edge of the cap body and  
having no part left on a neck part of the container, characterized in that said  
cap opening proof indication means comprises a plurality of indication pieces

extending from the lower edge of the cap body and a bridge to join the adjacent indication pieces and to be broken due to relative displacement of the adjacent indication pieces when the cap should be opened and a flap provided at a portion of at least one of the adjacent indication pieces in a manner where said flap is able to be bended and having a leading edge to be engaged with a protrusion stripe engagement portion on a lower side of the neck part of the container and that the indication piece adjacent to the indication piece having the flap is provided with flap protrusion prevention to prevent the flap developed when the cap is opened from protruding from the inner face of the cap body.

[0016]

In the container cap of the invention, the flap protrusion prevention is preferably formed to prevent the leading edge of the flap.

[0017]

Furthermore, in the container cap of the invention, the indication piece having the flap and the indication piece adjacent to the former indication piece form one indication means unit and the adjacent indication means units are provided desirably in a manner spaced circumferentially.

[0018]

In the indication means units, the indication pieces adjacent to the one having the flap are disposed on both sides of the indication piece having the flap.

[0019]

The flap protrusion prevention may be in the form of one comprising small width formation portion formed on the opposite faces of the indication pieces on both sides of the indication piece having the flap toward the direction where the opposite faces approach each other.

[0020]

Furthermore, the small width formation portion of the flap protrusion prevention may be in the form of a thinner piece extending integrally from the opposite inner sides of the indication pieces on both sides.

[0021]

5           In addition thereto, in the flap protrusion prevention, the small width formation portion desirably has an inclination face inclined downward and outward and the corresponding flap desirably has an inclination face to be slipperily moved along the inclination face of the flap protrusion prevention.

[0022]

10           The indication piece having the flap may be in the form of one having a recess into which the flap is inserted so that the flap never protrudes inside of the inner peripheral face of the cap body when the flap is superposed on the corresponding indication piece in a state where it is bended.

[0023]

15           In this manner, since the cap opening proof indication means is so constructed that the bridge joining the adjacent ones of the plurality of indication pieces extending from the lower edge of the cap body is broken due to expansion of the adjacent indication pieces when the cap is opened, the cap opening proof can be indicated and also since these indication pieces are  
20           never left on the neck part of the container, the operation of removing the parts of the cap opening proof indication means is not required when the container should be recycled.

[0024]

25           Furthermore, since the flap provided on at least one of the adjacent indication pieces in a manner where it is able to be bended to be engaged with the engagement portion at the lower edge of the neck part of the container in the state where the flap is bended is never suspended so as to be protruded inward from the inner face of the cap body after the cap is opened by the flap

protrusion prevention provided on the lower side of the adjacent indication pieces, it is never made difficult to close the container by the cap due to an obstacle by the flap and therefore the operation of closing the container by the cap can be more easily performed.

5 [0025]

Especially, since the indication means comprising the indication pieces having the flap and the indication pieces adjacent to the former are provided in a manner spaced circumferentially, material of the cap opening proof indication means can be saved and therefore the cost of material can be reduced to be able to provide the cap more inexpensively.

10 [0026]

Since the indication pieces adjacent to the one having the flap are provided on both sides of the indication piece, the suspension of the flap after the cap is opened is held on both sides thereof due to the flap protrusion prevention provided on the both side indication pieces and therefore, the flap can be positively prevented from being danglantly protruded in the direction of the inner diameter of the cap body.

15 [0027]

Furthermore, since the flap protrusion prevention comprises the small width formation portion provided on the lower opposite faces of the indication pieces on both sides of the indication piece having the flap and extending toward the direction where they approach each other, the flap protrusion prevention is opened at its middle portion and therefore, the flap can pass over the engagement portion and be developed when the cap is opened whereby the movement of the flap to be engaged with the flap protrusion prevention can be easily accomplished without any resistance.

20 [0028]

Particularly, since the small width formation portion of the flap



protrusion prevention has the inclination face inclined outward and downward and the corresponding flap has the inclination face which is slipperily moved along the inclination face of the flap protrusion prevention, the flap can be guided to the engagement face of the flap protrusion prevention and therefore the flap can be positively engaged with the flap protrusion prevention.

## BRIEF DESCRIPTION OF THE DRWAINGS

[0029]

10            Fig. 1 is a front view of a container cap constructed in accordance with one embodiment of the invention;

             Fig. 2 is a longitudinal cross sectional view of the container cap of Fig. 1;

             Fig. 3 illustrates one indication means unit in an enlarged manner wherein Fig. 3A is a back view of the unit and Fig. 3B is an enlarged horizontal cross sectional view of a bridge joining an indication piece with a flap and one of the adjacent indication pieces;

             Fig. 4 is an enlarged longitudinal cross sectional view of a gist illustrating a relationship between the cap and the container before it is opened and the container with the peripheral wall portion of the cap body broken;

             Fig. 5 is an enlarged longitudinal cross sectional view of the gist at the same cross sectional position as that of Fig. 4, but illustrating a state where the bridge is broken at the same time when the cap begins to be opened ;

             Fig. 6 is an enlarged longitudinal cross sectional view of the gist illustrating in a state which is further advanced from the state of Fig. 5 and where the flap of the cap opening proof indication means is removed from the

container together with the cap body;

Fig. 7 is an enlarged longitudinal cross sectional view of the gist illustrating in a state which is further advanced from the state of Fig. 6 and where the flap of the cap opening proof indication means is engaged with a  
5 flap protrusion prevention;

Fig. 8 is a front view of the container cap after the cap is opened;

Fig. 9 is a front view of a container cap constructed in accordance with another embodiment of the invention; and

Fig. 10 is a front view of a container cap constructed in accordance  
10 with further embodiment of the invention.

## BEST MODE OF EMBODIMENT OF INVENTION

[0030]

Describing a container cap according to one embodiment of the  
15 invention in details with reference to Figs. 1 through 3, the container cap 10 comprises a crown-shaped cap body 14 to be screwed onto a container 12 (see Figs. 4 through 7) and cap opening proof indication means 16 provided at a lower edge of the cap body 14 and formed so as to have no part left on a neck part 12N of the container 12 after the cap is opened. The cap 10 may be  
20 integrally formed by injection-molding or compression-molding plastic material such as high density polyethylene or polypropylene.

[0031]

As shown in Fig. 2, the crown-shaped cap body 14 has a female screw 14T provided on an inner peripheral face thereof to be engaged with a male  
25 screw 12T (see Figs. 4 through 7) provided on the neck part 12N of the container 12.

[0032]

As shown in Figs. 1 and 2, the cap opening proof indication means 16

comprises a plurality of indication means units 16U extending downward from the lower edge of the cap body 14 and in the illustrated form, four indication means units 16U are provided in a manner spaced circumferentially.

5 [0033]

Each of the indication means units 16U comprises a plurality of indication pieces 18 extending downward from the lower edge 14E of the cap body 14, a bridge 20 (see Fig. 3) to join the adjacent indication pieces 18 at their small area and to be broken due to relative displacement of the adjacent  
10 indication pieces 18 when the cap should be opened and a flap 22 provided at a portion of at least one 18F of the adjacent indication pieces 18 in a manner where it is able to be bended and to be engaged with a protrusion stripe engagement portion 12P (see Figs. 4 through 7) on a lower side of the neck part 12N of the container 12 in a state where it is bended. The flap 22 has the  
15 width slightly narrower than the width of the indication piece 18F continuing with the flap 22.

[0034]

As shown in Fig. 2, the indication pieces 18 extend downward from an annular inclination connection portion 24 inclined aslant outward from the  
20 lower edge 14E of the cap body 14 and therefore, the cap opening proof indication means 16 is positioned outside in a diametrical direction relative to the cap body 14. This serves to prevent the flap 22 from being protruded inward relative to the inner peripheral face of the cap body 14 when the flap 22 is folded so as to be superposed on the corresponding indication piece 18F  
25 in a state where the flap is bended. The inclination connection portion 24 may be not annular and be provided independently from each of the indication pieces.

[0035]

As shown in Fig. 2, the indication piece 18F with the flap 22 having the thickness getting gradually smaller downward from the inclination connection portion 24 and is connected to the flap 22 at the thinnest portion 18FT thereof. The flap 22 gets gradually thicker upward from the thinnest portion 18FT. This flap 22 extends upward so as to be turned up adjacent to the thinnest portion 18FT of the indication piece 18F.

[0036]

As noted from Fig. 2, a variation in thickness of the indication piece 18F from the upper edge to the thinnest portion 18FT forms a recess 18R where the flap 22 is contained in a state where the flap 22 is folded on the inner face of the indication piece 18F so as to be superposed on the indication piece 18F. This recess 18R is associated with the inclination connection portion 24 to positively prevent the flap 22 from being protruded inward relative to the inner peripheral face of the cap body 14 when the flap 22 is folded so as to be superposed on the corresponding indication piece 18F in a state where the flap 22 is bended.

[0037]

The cap opening proof indication means 16 is provided with flap protrusion prevention 26 to prevent the flap 22 from protruding from the inner face of the cap body 14 when the flap 22 is developed on indication pieces 18S and 18S' adjacent to the indication piece 18F with the flap from the state where it is folded (see Fig. 7).

[0038]

In the illustrated embodiment, the flap protrusion prevention 26 may comprise narrower width formation portions 28 and 28' extending on the lower opposite faces of the indication pieces 18S and 18S' on both sides of the indication piece 18F with the flap toward the direction where they approach each other. As noted from Figs. 2 and 4 through 7, the narrower width

formation portions 28 and 28' may be formed by thinner pieces 28P and 28'P extending integrally from the edges of the inner sides of the opposite faces of the both side indication pieces 18S and 18S' (the inner sides of the cap body 14 in the diametrical direction).

5 [0039]

The thinner pieces 28P and 28'P of the flap protrusion prevention 26 have inclination faces 28PS and 28'PS inclined downward and outward while the corresponding flap 22 has an inclination face 22S adapted to be slipperily moved along the inclination faces 28PS and 28'PS of the flap protrusion  
10 prevention 26.

[0040]

As shown in Figs. 1 and 2, the container cap 10 of the invention may be manufactured as a single product having the aforementioned construction by molding plastic material. As the container cap 10 is positioned so as to  
15 cover the neck part 12N of the container 12 in a state of Fig. 2, the flap 22 extending upward from the lower portion of the indication piece 18F is restrained by the male screw 12T of the neck part 12N of the container 12 in the direction where the flap 22 is folded so as to be superposed on the corresponding indication piece 18F. Thus, as the cap body 14 is rotated, the  
20 female thread 14T of the cap is engaged with the male thread 12T on the neck part 12N of the container 12 whereby the cap body 14 closes the opening of the neck part 12N of the container 12 so that the cap 12 seals the container.

[0041]

25 In this manner, as the cap is completely tightened onto the container 12, the flap 22 of the indication pieces 18F with the flap is positioned below the protrusion stripe annular engagement portion 12P provided below the male thread 12T of the neck part 12N of the container 12 as shown in Fig. 4

and therefore, the flap 22 is released from being restrained by the male thread 12T of the container 12, displaced so as to be developed inward by resilience of the flap 22 itself from the superposition of the indication piece 18F and engaged with the lower face of the protrusion stripe engagement  
5 portion 12P.  
[0042]

As the container 12 is opened by manually rotating the cap 10 so as to release the threaded engagement of the cap 10 from the aforementioned state, the cap body 14 gradually moves upward relative to the neck part 12N of the  
10 container 12. Since the flap 22 is prevented by the annular engagement portion 12P of the container 12 as shown in Fig. 5, the flap 22 is displaced so as to develop the corresponding indication piece 18F while the flap 22 is forced against the lower face of the annular engagement portion 12P and the outer peripheral face of the neck portion 12N of the container 12, which  
15 follows the engagement portion 12P as the cap body 14 upwardly moves. At that time, since the indication pieces 18S and 18S' on both sides of the indication piece 18F is never subject to the displacement due to the development of the flap 22, the indication pieces 18S and 18S' and the indication piece 18F are relatively displaced inward and outward in the  
20 diametrical direction and therefore, the bridge 20 of smaller area joining the indication piece 18F and the both side indication pieces 18S and 18S' is broken. This breakage of the bridge 20 indicates or proves the cap opening.  
[0043]

As the cap body 14 further upwardly moves, the flap 22 is developed  
25 while guided from the flap protrusion prevention 26 outward of the thinner pieces 28P and 28'P due to movement of the outer peripheral face of the annular engagement portion 12P closer to the thinner pieces 28P and 28'P of the flap protrusion prevention 26 and therefore, the flap 22 is prevented by

the flap protrusion prevention 26 from being protruded inward of the cap body 14 (see a dotted line of Fig. 3A). In this manner, the flap 22 never obstructs the operation of closing the container 12 by the cap 10 and in addition thereto, the flap 22 can be easily observed outside of the adjacent  
5 indication pieces 18S and 18S' whereby the indication of the cap opening proof can be more clearly made.

[0044]

In this manner, the indication pieces 18 and the flap 22 moves upwardly in a state of the development of the flap 22 together with the cap  
10 body 14 and the cap 10 can be removed from the container 12 without any part left on the neck part 12N of the container. Fig. 8 shows the cap 10 removed from the container 12.

[0045]

The cap 10 can again cover and be engaged with the container 12 in  
15 order to again close the mouth of the container 12 after the cap is opened. In this case, the flap 22 of the indication piece 18F with the flap removed from the container 12 together with the cap body 14 is prevented by the flap protrusion prevention 26 from being suspended in the dangling state inside of the cap body 14 and therefore, the flap 22 never obstructs the threaded  
20 engagement of the cap body 14 with the container 12. Thus, the cap 10 can be more easily tightly engaged with the container 12.

[0046]

Although, in the illustrated embodiment, the flap protrusion prevention 26 is provided on the lower portion of the both side indication  
25 pieces 18S and 18S' to be engaged with the leading end 22L of the flap 22, it may be engaged only with the edges of both sides of the flap 22 or with both of the leading edge and the edges of both sides of the flap 22 so long as it can pass over the flap protrusion prevention 26 when the cap should be opened.

[0047]

In Fig. 9 is illustrated another embodiment of the invention. In this embodiment, the cap is substantially identical to that of Figs. 1 through 8 except that the outer indication piece 18S forming one unit 16U of the adjacent indication means units 16U and the opposed outer indication piece 18S' of the other unit 16U continue through the upper edge 18UE so as to form an arch-like notch.

[0048]

In Fig. 10 is illustrated further embodiment of the invention. In this embodiment, the cap is substantially identical to that of Figs. 1 through 8 and Fig. 9 except that the opposed indication piece 18S and 18S' of the adjacent indication means units 16U continue through the wall 18W and the function and the effect thereof is identical to the embodiments of Figs. 1 through 8 and Fig. 9 except the cost of material cannot be saved.

15

## POSSIBILITY OF UTILIZATION IN INDUSTRIES

[0049]

According to the container cap of the invention, since the cap opening proof indication means has no part left on the neck part of the container after the cap is opened, the operation of removing any residuum of the cap opening proof indication means is not required when the container should be recycled, which causes the recycling operation to be more easily performed. Also, since the flap to be removed from the container together with the cap body after the cap is opened is prevented from being protruded inward, the cap can be attached onto the container without any obstacle with the result that the possibility of utilization in industries can be improved.

25